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BOX PATENT APPLICATION
Assistant Commissioner for Patents
Washington, D.C. 20231

Re: Masaaki SATOU
SERVER-CLIENT TYPE SYSTEM AND
DATA DOWNLOADING METHOD
Our Ref. Q60692

Dear Sir:

Attached hereto is the application identified above including 37 sheets of the specification, claims, 9 sheets of informal drawings, executed Assignment and PTO 1595 form, and executed Declaration and Power of Attorney. Also enclosed is the Information Disclosure Statement with form PTO-1449 and reference.

The Government filing fee is calculated as follows:

Total claims	12	- 20	=		x	$18.00	= $.00
Independent claims	4	- 3	=	1	x	$78.00	= $78.00
Base Fee							$690.00
TOTAL FILING FEE							**$768.00**
Recordation of Assignment							$40.00
TOTAL FEE							**$808.00**

Checks for the statutory filing fee of $768.00 and Assignment recordation fee of $40.00 are attached. You are also directed and authorized to charge or credit any difference or overpayment to Deposit Account No. 19-4880. The Commissioner is hereby authorized to charge any fees under 37 C.F.R. §§ 1.16 and 1.17 and any petitions for extension of time under 37 C.F.R. § 1.136 which may be required during the entire pendency of the application to Deposit Account No. 19-4880. A duplicate copy of this transmittal letter is attached.

Priority is claimed from September 14, 1999 based on Japanese Application No. 11-259979. The priority document is enclosed herewith.

Respectfully submitted,
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SERVER-CLIENT TYPE SYSTEM AND DATA DOWNLOADING METHOD

BACKGROUND OF THE INVENTION

FIELD OF THE INVENTION

The present invention relates to a server-client type system and a data downloading method and, more particularly, to a server-client type system using ISDN lines and a data downloading method using ISDN lines.

DESCRIPTION OF THE RELATED ART

In a server-client type system in which a terminal adapter (TA) at a user home connected to a telephone, a facsimile device (hereinafter referred to as FAX), a personal computer (hereinafter referred to as PC), etc. is connected to a server through a first digital service unit (DSU), an Integrated Service Digital Network (ISDN) and a second DSU, at the time of downloading data existing in a client's terminal at the user home from the server, it is a conventional practice to start data downloading immediately at that time. On this occasion, the D-channel (Dch) packet exchange will serve for the downloading of a small volume of data (not more than several tens k bytes), while the same will take much time for the downloading of a large volume of data (several M bytes for program data etc. in general).

Under these circumstances, the data downloading method using Bch is conventionally known (Japanese Patent Laying-Open (Kokai) No. Heisei 4-120843). In the

conventional data downloading method, a terminal device in advance downloads data to be downloaded into a line control device, while the line control device downloads the downloaded data into an apparatus accommodated in the ISDN network through Bch, thereby realizing data downloading through Bch having a high transmission rate independently of a transmission rate of a standard interface to reduce a downloading time.

For reference, time and charges for transmitting 4M-byte data (4096k bytes) within a relevant area are as follows. First, in a case of the Dch packet exchange, a transmission rate of Dch is 16 (k bytes/sec) and a transmission time of 4M-byte transmission data will be accordingly 256 seconds (=4096 (k bytes) ÷ 16 (k bytes/sec)). However, in a case of a packet, taking a header attached to each packet, and accumulation at an exchange and a transfer time into consideration, the transmission time will be approximately one and a half the above transmission time, that is, 384 seconds.

As to communication charges incurred in the Dch packet exchange, assuming that it costs 0.8 yen per packet and that transmission is conducted with one packet of 256 octets (0.25k bytes), 4M-byte transmission data is equivalent to 16384 packets (=4096 (k bytes) ÷ 0.25 (k octets)) to charge 13107.2 (yen) (=16384 (packets) x 0.8 (yen/packet).

In a case of the Bch packet exchange, a

transmission rate of Bch is 64 (k bytes/sec), so that a transmission time of the 4M-byte transmission data is 64 (sec) (=4096 (k bytes) ÷ 64 (k bytes/sec)). However, since in a case of a packet, the transmission time will be approximately one and a half the above transmission time, that is, 96 seconds taking a header attached to each packet, and accumulation at an exchange and a transfer time into consideration.

As to communication charges incurred in the Bch packet exchange, assuming that it costs 6.2 yen per packet and that transmission is conducted with one packet of 4096 octets (4k bytes), 4M-byte transmission data is equivalent to 1024 packets (=4096 (k bytes) ÷ 4 (k octets)) to charge 6348.8 yen (=1024 (packets) x 6.2 (yen/packets)).

In a case of the Bch line exchange, a transmission time of the 4M-byte transmission data is 64 (sec) (=4096(k bytes) ÷ 64 (k bytes/sec)) and its charge will be 10 yen within three minutes in the area. Calculation on the above transmission of data of 4M-byte size will be summarized as follows.

[TABLE 1]

THE KIND OF LINE	TIME(sec)	CHARGES(yen)
Dch packet exchange	384	13107
Bch packet exchange	96	6348
Bch line exchange	64	10

As can been seen from the above Table 1, as to transmission of a large volume of data (of several M bytes), using the Bch line exchange taking charges and time into consideration is most preferable.

In the above-described conventional data downloading method, however, since the calculation results in the above Table 1 are obtained in a case where a transfer efficiency is 100 percent and there is no error, lines are occupied at least for 64 seconds, and at this time if other equipment at the user home is in use using the remaining Bch, which means that both of the two Bch lines are in use, even when the telephone should be used in emergency, it is necessary to wait for either line to be freed, which prevents efficient line use and sharing.

SUMMARY OF THE INVENTION

An object of the present invention is to provide a server-client type system and a data downloading method enabling efficient line use and sharing.

According to the first aspect of the invention, a server-client type system in which a terminal device on a client side is connected to a server through an ISDN network and corresponding one or at least two digital service units, wherein

the server comprises

notification means for notifying, when a large volume of data to be transmitted whose volume is not less than a predetermined value is generated, to the terminal device as a transmission destination to the effect that the large volume of data is to be transmitted by the D-channel packet exchange, and

transmission means for, after the reception of a data transmission timing signal from the terminal device, starting transmission of the large volume of data using a B-channel to cause the terminal device to download the large volume of data, and

the terminal device comprises

monitoring means for monitoring a state of a free B-channel line of all ISDN communication devices on the client side connected to the digital service unit to which the terminal device in question is connected upon receiving the notification of transmission of the large volume of data from the server, and

transmission allowance notifying means for notifying the server of the data transmission timing signal by the D-channel packet exchange at timing not preventing use of a B-channel line with the help of the monitoring means.

According to the present invention, since a data transmission timing signal is notified to a server by the Dch packet exchange at timing not preventing use of Bch lines at a terminal device and when receiving the

data transmission timing signal, the server transmits data to the terminal device for downloading, downloading taking user's line use into consideration first of all is possible.

In the preferred construction, the terminal device comprises time zone determination means for determining, upon receiving the notification of transmission of the large volume of data from the server, whether the reception time is within a B-channel use-allowed time zone or not and when within the B-channel use-allowed time zone, transmitting the data transmission timing signal to the server.

In another preferred construction, the terminal device

if the time when the notification of transmission of the large volume of data is received from the server is within a B-channel use-allowed time zone, upon a lapse of a first predetermined time with the B-channels of all the ISDN communication devices connected to the digital service unit to which the terminal device in question is connected being all free, notifies the server of a transmission allowance to cause the server to transmit the large volume of data, and

if the time when the notification of transmission of the large volume of data is received from the server is not within the B-channel use-allowed time zone and at that time, a part of the B-channels of all the ISDN

communication devices connected to the digital service unit to which the terminal device in question is connected are free, notifies the server of a transmission non-allowance to cause the server receiving the transmission non-allowance to again notify the terminal device to the effect that the large volume of data is to be transmitted by the D-channel packet exchange upon a lapse of a second predetermined time.

In another preferred construction, the terminal device conducts calling to the server for downloading in place of the transmission allowance notification.

In another preferred construction, the terminal device conducts calling to the server for downloading, if there is at least one free B-channel line among all the ISDN communication devices connected to the digital service unit to which the terminal device in question is connected when the terminal device receives the notification of transmission of the large volume of data from the server.

According to the second aspect of the invention, a server-client type system in which at least one terminal device on a client side is connected to a server through an ISDN network and corresponding one or at least two digital service units, wherein

the server comprises

notification means for notifying, when a large volume of data to be transmitted whose volume is not

less than a predetermined value is generated, to the terminal device as a transmission destination to the effect that the large volume of data is to be transmitted together with a necessary data transmission time by the D-channel packet exchange, and

transmission means for, after the reception of a data transmission allowance signal from the terminal device, starting transmission of the large volume of data using a B-channel to cause the terminal device to download the large volume of data, and

the terminal device comprises

announcement means for, upon receiving the notification of transmission of the large volume of data with the data transmission time applied from the server, announcing the data transmission time to authorize a user to determine allowance/non-allowance of transmission, and

transmission allowance notifying means for notifying the transmission allowance signal by the D-channel packet exchange through operation of the user based on the announcement of the announcement means.

According to the present invention, since when a terminal device receives a notification of transmission of a large volume of data from a server, a user determines whether the transmission of the large volume of data from the server is allowed or not, no means is required for monitoring a state of use of Bch lines,

which makes downloading at timing according to user's intention possible.

According to the third aspect of the invention, a data downloading method in a server-client type system for transmitting data generated at a server to a terminal device on an arbitrary client side for downloading through an ISDN network and a digital service unit, comprising the steps of

the step, by the server, of notifying, when a large volume of data to be transmitted whose volume is not less than a predetermined value is generated, to the terminal device as a transmission destination to the effect that the large volume of data is to be transmitted by the D-channel packet exchange,

the step, by the terminal device receiving the notification of transmission of the large volume of data, of

monitoring a state of a free B-channel line of all ISDN communication devices connected to the digital service unit to which the terminal device in question is connected, and

notifying the server of a data transmission timing signal by the D-channel packet exchange at timing not preventing use of a B-channel line, and

the step, by the server, of, after receiving the data transmission timing signal, starting transmission of the large volume of data using the B-channel to cause

the terminal device to download the large volume of data.

According to the present invention, since a data transmission timing signal is notified to a server at timing not preventing use of Bch lines at a terminal device, and when receiving the data transmission timing signal, the server transmits data to the terminal device for downloading, downloading taking line use by a user into consideration first of all can be done.

In the preferred construction, the terminal device, upon receiving the notification of transmission of the large volume of data from the server, determines whether the reception time is within a B-channel use-allowed time zone or not and when within the B-channel use-allowed time zone, immediately transmits the data transmission timing signal to the server and when not within the B-channel use-allowed time zone, monitors a state of free B-channel lines.

In another preferred construction, the terminal device

if the time when the notification of transmission of the large volume of data is received from the server is within a B-channel use-allowed time zone, upon a lapse of a first predetermined time with the B-channels in all the ISDN communication devices connected to the digital service unit to which the terminal device in question is connected being all free, notifies the server of a transmission allowance to cause the server

to transmit the large volume of data, and

if the time when the notification of transmission of the large volume of data is received from the server is not within the B-channel use-allowed time zone and at that time, a part of the B-channels in all the ISDN communication devices connected to the digital service unit to which the terminal device in question is connected are free, notifies the server of a transmission non-allowance to cause the server receiving the transmission non-allowance to again notify the terminal device to the effect that the large volume of data is to be transmitted by the D-channel packet exchange upon a lapse of a second predetermined time.

In another preferred construction, the terminal device conducts calling to the server for downloading in place of the transmission allowance notification.

In another preferred construction, the terminal device conducts calling to the server for downloading, if there is at least one free B-channel line among all the ISDN communication devices connected to the digital service unit to which the terminal device in question is connected when the terminal device receives the notification of transmission of the large volume of data from the server.

According to another aspect of the invention, a data downloading method in a server-client type system for transmitting data generated at a server to a

terminal device on an arbitrary client side for downloading through an ISDN network and a digital service unit, comprising the steps of

the step, by the server, of notifying, when a large volume of data to be transmitted whose volume is not less than a predetermined value is generated, to the terminal device as a transmission destination to the effect that the large volume of data is to be transmitted together with a data transmission time by the D-channel packet exchange,

the step, by the terminal device receiving the notification, of announcing the data transmission time to authorize a user to determine allowance/non-allowance of transmission and notifying the transmission allowance signal by the D-channel packet exchange through operation of the user based on the announcement, and

the step, by the server, of, after receiving the data transmission allowance signal, starting the transmission of the large volume of data using the B-channel to cause the terminal device to download the large volume of data.

Other objects, features and advantages of the present invention will become clear from the detailed description given herebelow.

BRIEF DESCRIPTION OF THE DRAWINGS

The present invention will be understood more

fully from the detailed description given herebelow and from the accompanying drawings of the preferred embodiment of the invention, which, however, should not be taken to be limitative to the invention, but are for explanation and understanding only.

In the drawings:

Fig. 1 is a block diagram showing a server-client type system using an ISDN line according to one embodiment of the present invention;

Fig. 2 is a flow chart of a data downloading method according to one embodiment of the present invention;

Fig. 3 is a flow chart of the data downloading method according to a first embodiment of the present invention;

Fig. 4 is a sequence diagram showing a state where a client terminal receiving a notification of transmission of a large volume of data is at a time zone allowed to use Bch in Fig. 3;

Fig. 5 is a sequence diagram showing a state where the client terminal receiving a notification of transmission of a large volume of data is not at a time zone allowed to use Bch in Fig. 3;

Fig. 6 is a sequence diagram showing a state where the client terminal receiving a notification of transmission of a large volume of data is not at a time zone allowed to use Bch in Fig. 3;

Fig. 7 is a flow chart of a main part of a data downloading method according to a second embodiment of the present invention;

Fig. 8 is a sequence diagram of a data downloading method according to a third embodiment of the present invention;

Fig. 9 is a sequence diagram of a data downloading method according to a fourth embodiment of the present invention.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

The preferred embodiment of the present invention will be discussed hereinafter in detail with reference to the accompanying drawings. In the following description, numerous specific details are set forth in order to provide a thorough understanding of the present invention. It will be obvious, however, to those skilled in the art that the present invention may be practiced without these specific details. In other instance, well-known structures are not shown in detail in order to unnecessary obscure the present invention.

Fig. 1 is a block diagram showing a server-client type system according to one embodiment of the present invention. In present embodiment, a user home 10 is connected to a server 30 through a digital service unit (DSU) 60, an ISDN network 20 and a DSU 70. Also to the ISDN network 20, user homes 40 and 50 are connected

whose structure is similar to that of the user home 10.

The user home 10 is composed of a client terminal 10a such as a PC, a FAX 10b, a telephone 10c, and TAs 10d and 10e. The client terminal 10a is connected to the DSU 60 through the TA 10d, and the FAX 10b and the telephone 10c are connected to the DSU 60 through the TA 10e. The client terminal 10a such as a PC, the FAX 10b and the telephone 10c may be devices mounted with a packet assembly and disassembly function (hereinafter referred to as PAD function) or may not. In a case where a device not mounted with the PAD function is to be connected to an ISDN line, connection is enabled through a TA having the PAD function. In addition, these devices (PC, FAX, telephone etc.) may be mounted with the DSU function. Fig. 1 shows an example of the client terminal 10a such as PC, the FAX 10b and the telephone 10c having none of DSU and PAD functions.

Although the foregoing block structure itself is the same as that of a conventional system, the present embodiment is characterized in that the server 30 transmits a large volume of data to the client terminal 10a according to the flow chart of Fig. 2. More specifically, in the communication between the client terminal 10a and the server 30, when data to be transmitted is generated at the server 30 (Step 201 of Fig. 2), determination is made whether the contents of the data to be transmitted is of a small volume (not

more than several k bytes) or a large volume (Step 202 of Fig. 2) and when it is a small volume of data (Step 203 of Fig. 2), the server 30 conducts calling and transmission using the Dch packet exchange (Step 204 of Fig. 2). In this case, irrespectively of a line state of a transmission destination, that is, even when both of the two Bch lines are used and there remains no free line, data transmission and reception is possible.

On the other hand, when the data to be transmitted is of a large volume (several M bytes) (Step 205 of Fig. 2), the server 30 first notifies to the client terminal 10a as a transmission destination by the Dch packet exchange to the effect that a large volume of data is to be transmitted (Step 206 of Fig. 2). Upon receiving the notification, the client terminal 10a starts monitoring a Bch line state at the user home 10 (Step 207 of Fig. 2). By monitoring the state of a free Bch line at the user home 10, the client terminal 10a calls and notifies, to the server 30 which intends to send a large volume of data by the Dch packet exchange, a data transmission timing signal whose timing will not prevent Bch line use (Step 208 of Fig. 2).

During the time from Step 207 to Step 208, the server 30 is at a state of waiting a transmission allowance from the client terminal 10a. After receiving a data transmission allowance timing signal from the client terminal 10a, the server 30 starts data

downloading (Steps 209 and 210 of Fig. 2), which enables downloading of a large volume of data that will not prevent Bch use at the user home 10.

Next, description will be made of a data downloading method according to each embodiment of the present invention. Fig. 3 is a flow chart of a data downloading method according to a first embodiment of the present invention, Fig. 4 is a sequence diagram showing a state where a client terminal receiving a notification of transmission of a large volume of data is at a time zone allowed to use Bch in Fig. 3, Figs. 5 and 6 are sequence diagrams showing a state where the client terminal is not at a time zone allowed to use Bch. In Figs. 3 to 6, the same components as those in Fig. 1 are allotted the same reference numerals.

In the communication between the client terminal 10a and the server 30, when data to be transmitted is generated at the server 30 (Step 301 of Fig. 3, Step 51 of Fig. 4), determination is made whether the contents of the data to be transmitted is of a small volume (not more than several k bytes) or a large volume (Step 302 of Fig. 3) and when it is a small volume of data (Step 303 of Fig. 3), the server 30 conducts calling and transmission using the Dch packet exchange (Step 304 of Fig. 3, Step 52 of Fig. 4).

As to transmission and reception of a small volume of data, use of Dch packet exchange having a

disadvantage in transmission time and charges enables data transmission and reception irrespectively of a state of a Bch line use at the client terminal 10a side, that is, even if both of the two Bch lines are used to leave no free line (Step 53 of fig. 4). In the sequence diagram of Fig. 4, even during FAX transmission from the user home 10 using the B1 channel, for example, transmission or reception of a small volume of data is possible.

On the other hand, when the data to be transmitted is of a large volume (several M bytes), the server 30 first notifies by calling to the client terminal 10a as a transmission destination by the Dch packet exchange to the effect that a large volume of data is to be transmitted while ensuring its own line (Steps 305 and 306 of Fig. 3, Steps 55, 56 and 57 of Fig. 4). Upon receiving the notification, the client terminal 10a determines whether it is at a Bch use-allowed time zone (Step 307 of Fig. 3 and Step 59 of Fig. 4). Here, the Bch use-allowed time zone is a time period preset at the client terminal 10a. The communication sequence diagram of Fig. 4 shows processing conducted within the Bch use-allowed time zone.

More specifically, since the time when the notification of transmission of a large volume of data is received is within the use-allowed time zone, the client terminal 10a notifies the server 30 of a

transmission allowance unconditionally by the Dch packet exchange (Step 308 of Fig. 3, Steps 60 and 61 of Fig. 4). The server 30 at the state of waiting for a transmission allowance from the client terminal 10a starts data download transmission by the Bch line exchange upon receiving the notification (Step 309 of Fig. 3, Steps 63 and 64 of Fig. 4).

On the other hand, when the client terminal 10a receives the notification of transmission of a large volume of data, if it is not at the Bch use-allowed time zone, it starts monitoring a state of the Bch lines at the user home 10 (Step 310 of Fig. 3, Step 72 of Fig. 5).

At this time, if the number of free Bch lines at the user home 10 is two, the client terminal 10a notifies the server 30 of a transmission allowance by the Dch packet exchange upon a lapse of N seconds with none of the two lines used (Steps 311 to 314 of Fig. 3, Steps 73 and 74 of Fig. 5), assuming that the N seconds of no line use time is set at the client terminal 10a in advance.

After giving the notification of transmission of a large volume of data, the server 30 remains at the state of waiting for a transmission allowance from the client terminal 10a (Step 68 of Fig. 5) and upon receiving a notification of a data transmission allowance from the client terminal 10a, immediately starts data download transmission by the Bch line

exchange (Steps 315 and 316 of Fig. 3, Steps 76 and 77 of Fig. 5). During the downloading, only one line of the Bch lines is occupied and the remaining one is usable at the user side, so that, for example, while downloading is conducted using the B1 channel, the telephone can be used using the B2 channel (Step 78 of Fig. 5).

In a case where when the notification of transmission of a large volume of data is received by the client terminal 10a, it is not at the Bch use-allowed time zone and the number of free Bch lines at the user home 10 is ten channels or zero channel (Step 317 of Fig. 3), the client terminal 10a gives a notification of transmission non-allowance to the server 30 (Step 318 of Fig. 3, Steps 82 and 83 of Fig. 6). After receiving the notification of the transmission non-allowance, upon a lapse of T seconds, the server 30 again notifies the client terminal 10a to the effect that a large volume of data is to be transmitted by the Dch packet exchange (Steps 319 and 320 of Fig. 3, Steps 84 and 85 of Fig. 6).

After receiving the notification, the client terminal 10a repeats the operation of Step 306 and the following steps as described above. More specifically, the client terminal 10a is first allowed to give a notification of a transmission allowance to the server 30 when both of the two Bch lines have not been used for N seconds (Steps 311, 312, 313 and 314 of Fig. 3, Steps

86, 87 and 88 of Fig. 6). The client terminal 10a having given the transmission allowance enters a download data reception waiting state. Immediately upon receiving the notification of the transmission allowance, the server 30 starts data download transmission by the Bch line exchange (Steps 315 and 316 of Fig. 3, Steps 89 and 90 of Fig. 6).

The example of Fig. 6 shows a case where after the client terminal 10a transmits a notification of a transmission non-allowance to the server 30 (Step 82), use of the B2 channel by a user ends (Step 91) and thereafter the client terminal 10a receives a notification of transmission of a large volume of data from the server 30 to again start monitoring of lines of the user home 10 (Step 92) and transmits a notification of transmission allowance to the server 30 upon a lapse of N seconds without the use of the Bch lines.

Next, the second embodiment of the present invention will be described. Fig. 3 shows a flow chart of main parts of a data downloading method according to the second embodiment of the present invention. The second embodiment is a modification of the first embodiment obtained by arranging such that regarding the step (Step 307) of changing the data transmission allowance notification manner in the flow chart of Fig. 3 depending on a Bch use-allowed time zone, at the time of receiving a notification from the server 30 by the

client terminal 10a by means of the Dch packet exchange to the effect that a large volume of data is to be transmitted (Step 306), a transfer time of download data is at the same time notified through display indication or voices to enable a user himself or herself having received the notification to give data transmission allowance/non-allowance.

In other words, the second embodiment is realized by replacing the processing at Step 305 and the following steps in Fig. 3 by the processing shown in the flow chart of Fig. 7. When a request for transmission of a large volume of data is generated, the server first notifies the client terminal by the Dch packet exchange to that effect with a data transmission time applied (Steps 701 and 702 of Fig. 7). Upon receiving the downloading notification, the client terminal displays the transmission time or gives a voice notification of the time to authorize the user to determine whether the transmission is allowed or not (Steps 703, 704 and 705 of Fig. 7). For example, output such an indication that "data transmission time = 10 minutes, data transmission allowed = OK, data transmission not allowed = NG" on a display. Here, when the user allows data transmission, the client terminal notifies the server of the allowance through the Dch packet exchange network (Step 706 of Fig. 7) and upon receiving the notification, the server starts downloading (Step 707 of Fig. 7).

On the other hand, when the user does not allow data transmission at Step 705 of Fig. 7, the client terminal notifies the server to that effect through the Dch packet exchange network (Step 708 of Fig. 7) and after receiving the notification, the server enters a state of waiting for a transmission allowance from the client terminal (Step 709 of Fig. 7). Upon obtaining allowance of transmission by the user, the client terminal gives a transmission allowance notification to the server through the Dch packet exchange network (Steps 710 and 706 of Fig. 7). Upon receiving the transmission allowance notification, the server starts downloading (Step 707 of Fig. 7).

As described in the foregoing, in a case where timing at which a transmission allowance is notified is determined by a user as in the second embodiment, it will be unnecessary for the client terminal to monitor a free line state on the user side, making more efficient line use and sharing possible than those in the first embodiment.

Next, the third embodiment of the present invention will be described. Fig. 8 is a sequence diagram of a data downloading method according to the third embodiment of the present invention. In the figure, the same parts of the processing as those of Fig. 5 are allotted the same reference numerals. While in the above first embodiment, at the data downloading by the server,

data transmission is all conducted upon calling from the server as shown in the flow chart of Fig. 3, in this third embodiment, the client terminal side conducts calling for data downloading after receiving a notification from the server to the effect that a large volume of data is to be transmitted.

More specifically, in Fig. 8, when the client terminal 10a receives a notification of transmission of a large volume of data from the server, the terminal starts monitoring the Bch line when it is not at the Bch use-allowed time zone and conducts calling for downloading when the line is not used for N seconds from the starting time point of monitoring (Steps 59, 72, 120 and 121 of Fig. 8). The server 30 starts downloading at the time of receiving the calling (Steps 122 and 123 of Fig. 8). In other words, in the present embodiment, calling from the client terminal 10a corresponds to a data transmission allowance to the server 30. Such processing eliminates the possibility that in a time period from the time when the client terminal 10a gives a notification of a transmission allowance to the time when the server 30 starts data downloading, download will not be enabled because of use of a line by the user.

During data downloading, of the user side lines, one Bch is in use for downloading, the other Bch line is free to allow use by the user (Step 124 of Fig. 8). In Fig. 8, during downloading using the B1 channel,

communication with the user home 40 is made using a telephone by means of the B2 channel.

Next, the fourth embodiment of the present invention will be described. Fig. 9 is a sequence diagram of a data downloading method according to the fourth embodiment of the present invention. In the figure, the same parts of the processing as those of Fig. 5 are allotted the same reference numerals. While in the above first embodiment, as shown in the flow chart of Fig. 3, the client terminal 10a unconditionally outputs a transmission allowance to the server 30 when it is within the Bch use-allowed time zone, and when it is not within the Bch use-allowed time zone, outputs a transmission allowance only when both of the two Bch lines are free, thereby preventing a user's line from entering a state of busy, in the present embodiment, after a confirmation made by the user, procedures are set.

More specifically, upon receiving a notification of transmission of a large volume of data, the client terminal 10a checks a Bch line state (Step 130 of Fig. 9) and when at least one Bch line is free, conducts calling for downloading after a confirmation made by the user (Steps 131 and 132 of Fig. 9). Upon receiving the calling, the server 30 starts transmission of data to be downloaded (Step 134 of Fig. 9).

After the data downloading is finished, when

another large volume of data to be transmitted is generated, the server 30 again notifies the client terminal 10a to that effect (Steps 135, 136 and 138 of Fig. 9) to enter the transmission allowance waiting state (Step 137 of Fig. 9). Upon receiving the notification of transmission of a large volume of data, the client terminal 10a checks the Bch line state (Step 139 of Fig. 9). At this time point, although the user home 10 is using the telephone for conversation with the user home 40 by means of the B2 channel, the B1 channel is free, whereby the user confirms that only one Bch line is occupied to conduct calling for downloading (Steps 140, 141 and 142 of Fig. 9). Upon receiving the calling, the server 30 starts transmission of the data to be downloaded by using the B2 channel (Step 143 of Fig. 9). According to the fourth embodiment, the same effect as that of the first embodiment can be obtained.

As described in the foregoing, according to the present invention, since a data transmission timing signal is notified to the server by the D-channel packet exchange at timing not preventing use of a B-channel line at the terminal device and after the reception of the data transmission timing signal, the server first transmits data to the terminal device for downloading, downloading is enabled by the output of a timing signal from the terminal device taking a user's line use into consideration first of all, for example, by setting such

a priority time zone for downloading as "Bch use-allowed time", thereby realizing efficient line use and sharing without preventing user's line use.

In addition, according to the present invention, since when the terminal device receives a notification of transmission of a large volume of data from the server, a user determines whether the transmission of a large volume of data from the server is allowed or not, downloading is possible at timing according to a user's intention without the need of a means for monitoring a state of use of B-channel lines, whereby more flexible and efficient line use and sharing is possible according to a user's intention.

Although the invention has been illustrated and described with respect to exemplary embodiment thereof, it should be understood by those skilled in the art that the foregoing and various other changes, omissions and additions may be made therein and thereto, without departing from the spirit and scope of the present invention. Therefore, the present invention should not be understood as limited to the specific embodiment set out above but to include all possible embodiments which can be embodies within a scope encompassed and equivalents thereof with respect to the feature set out in the appended claims.

WHAT IS CLAIMED IS:

1. A server-client type system in which a terminal device on a client side is connected to a server through an ISDN network and corresponding one or at least two digital service units, wherein

said server comprises:

notification means for notifying, when a large volume of data to be transmitted whose volume is not less than a predetermined value is generated, to said terminal device as a transmission destination to the effect that the large volume of data is to be transmitted by the D-channel packet exchange; and

transmission means for, after the reception of a data transmission timing signal from said terminal device, starting transmission of said large volume of data using a B-channel to cause the terminal device to download the large volume of data, and

said terminal device comprises:

monitoring means for monitoring a state of a free B-channel line of all ISDN communication devices on the client side connected to said digital service unit to which the terminal device in question is connected upon receiving said notification of transmission of the large volume of data from said server; and

transmission allowance notifying means for notifying said server of said data transmission timing

signal by the D-channel packet exchange at timing not preventing use of a B-channel line with the help of said monitoring means.

2. The server-client type system according to claim 1, wherein

said terminal device comprises time zone determination means for determining, upon receiving said notification of transmission of the large volume of data from said server, whether the reception time is within a B-channel use-allowed time zone or not and when within the B-channel use-allowed time zone, transmitting said data transmission timing signal to said server.

3. The server-client type system according to claim 1, wherein

said terminal device

if the time when said notification of transmission of the large volume of data is received from said server is within a B-channel use-allowed time zone, upon a lapse of a first predetermined time with the B-channels of all the ISDN communication devices connected to said digital service unit to which the terminal device in question is connected being all free, notifies said server of a transmission allowance to cause the server to transmit said large volume of data, and

if the time when said notification of transmission of the large volume of data is received from said server is not within said B-channel use-allowed time zone and at that time, a part of the B-channels of all the ISDN communication devices connected to said digital service unit to which the terminal device in question is connected are free, notifies said server of a transmission non-allowance to cause the server receiving the transmission non-allowance to again notify said terminal device to the effect that said large volume of data is to be transmitted by the D-channel packet exchange upon a lapse of a second predetermined time.

4. The server-client type system according to claim 3, wherein

said terminal device conducts calling to said server for downloading in place of said transmission allowance notification.

5. The server-client type system according to claim 1, wherein

said terminal device conducts calling to said server for downloading, if there is at least one free B-channel line among all the ISDN communication devices connected to said digital service unit to which the terminal device in question is connected when the

terminal device receives said notification of transmission of the large volume of data from said server.

6. A server-client type system in which at least one terminal device on a client side is connected to a server through an ISDN network and corresponding one or at least two digital service units, wherein

said server comprises:

notification means for notifying, when a large volume of data to be transmitted whose volume is not less than a predetermined value is generated, to said terminal device as a transmission destination to the effect that the large volume of data is to be transmitted together with a necessary data transmission time by the D-channel packet exchange; and

transmission means for, after the reception of a data transmission allowance signal from said terminal device, starting transmission of said large volume of data using a B-channel to cause the terminal device to download the large volume of data, and

said terminal device comprises:

announcement means for, upon receiving said notification of transmission of the large volume of data with the data transmission time applied from said server, announcing said data transmission time to authorize a user to determine allowance/non-allowance of

transmission; and

transmission allowance notifying means for notifying said transmission allowance signal by the D-channel packet exchange through operation of said user based on the announcement of said announcement means.

7. A data downloading method in a server-client type system for transmitting data generated at a server to a terminal device on an arbitrary client side for downloading through an ISDN network and a digital service unit, comprising the steps of:

the step, by said server, of notifying, when a large volume of data to be transmitted whose volume is not less than a predetermined value is generated, to said terminal device as a transmission destination to the effect that the large volume of data is to be transmitted by the D-channel packet exchange,

the step, by said terminal device receiving said notification of transmission of the large volume of data, of:

monitoring a state of a free B-channel line of all ISDN communication devices connected to said digital service unit to which the terminal device in question is connected, and

notifying said server of a data transmission timing signal by the D-channel packet exchange at timing not preventing use of a B-channel line, and

the step, by said server, of, after receiving the data transmission timing signal, starting transmission of said large volume of data using the B-channel to cause said terminal device to download the large volume of data.

8. The data downloading method according to claim 7, wherein

said terminal device, upon receiving said notification of transmission of the large volume of data from said server, determines whether the reception time is within a B-channel use-allowed time zone or not and when within the B-channel use-allowed time zone, immediately transmits said data transmission timing signal to said server and when not within said B-channel use-allowed time zone, monitors a state of free B-channel lines.

9. The data downloading method according to claim 7, wherein

said terminal device

if the time when said notification of transmission of the large volume of data is received from said server is within a B-channel use-allowed time zone, upon a lapse of a first predetermined time with the B-channels in all the ISDN communication devices connected to said digital service unit to which the

terminal device in question is connected being all free, notifies said server of a transmission allowance to cause the server to transmit said large volume of data, and

if the time when said notification of transmission of the large volume of data is received from said server is not within said B-channel use-allowed time zone and at that time, a part of the B-channels in all the ISDN communication devices connected to said digital service unit to which the terminal device in question is connected are free, notifies said server of a transmission non-allowance to cause the server receiving the transmission non-allowance to again notify said terminal device to the effect that said large volume of data is to be transmitted by the D-channel packet exchange upon a lapse of a second predetermined time.

10. The data downloading method according to claim 9, wherein

said terminal device conducts calling to said server for downloading in place of said transmission allowance notification.

11. The data downloading method according to claim 7, wherein

said terminal device conducts calling to said

server for downloading, if there is at least one free B-channel line among all the ISDN communication devices connected to said digital service unit to which the terminal device in question is connected when the terminal device receives said notification of transmission of the large volume of data from said server.

12. A data downloading method in a server-client type system for transmitting data generated at a server to a terminal device on an arbitrary client side for downloading through an ISDN network and a digital service unit, comprising the steps of:

the step, by said server, of notifying, when a large volume of data to be transmitted whose volume is not less than a predetermined value is generated, to said terminal device as a transmission destination to the effect that the large volume of data is to be transmitted together with a data transmission time by the D-channel packet exchange,

the step, by said terminal device receiving the notification, of announcing said data transmission time to authorize a user to determine allowance/non-allowance of transmission and notifying said transmission allowance signal by the D-channel packet exchange through operation of said user based on the announcement, and

the step, by said server, of, after receiving the data transmission allowance signal, starting the transmission of said large volume of data using the B-channel to cause said terminal device to download the large volume of data.

ABSTRACT OF THE DISCLOSURE

In a server-client type system, when a large volume of data to be transmitted whose volume is not less than a predetermined value is generated, a server notifies to a terminal device as a transmission destination to the effect that the large volume of data is to be transmitted by the D-channel packet exchange, and after receiving a data transmission timing signal from the terminal device, starts transmission of the large volume of data using a B-channel to cause the terminal device to download the large volume of data, and the terminal device monitors a state of a free B-channel line in all ISDN communication devices on the client side connected to the same digital service unit upon receiving the notification of transmission of the large volume of data from the server and notifies the server of the data transmission timing signal by the D-channel packet exchange at timing not preventing use of a B-channel line.

FIG. 1

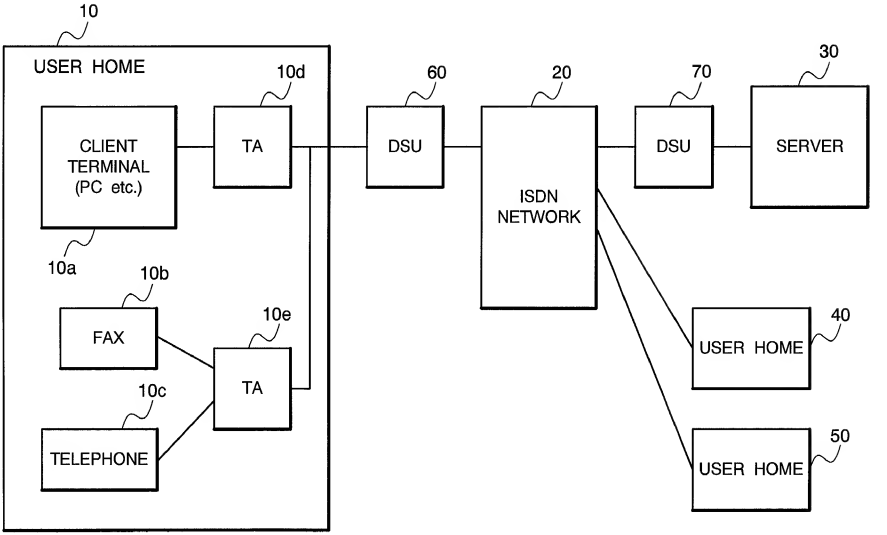

10
USER HOME
10d
60
20
70
30
CLIENT TERMINAL (PC etc.)
TA
DSU
ISDN NETWORK
DSU
SERVER
10a
10b
10e
FAX
TA
10c
TELEPHONE
USER HOME
40
USER HOME
50

FIG.2

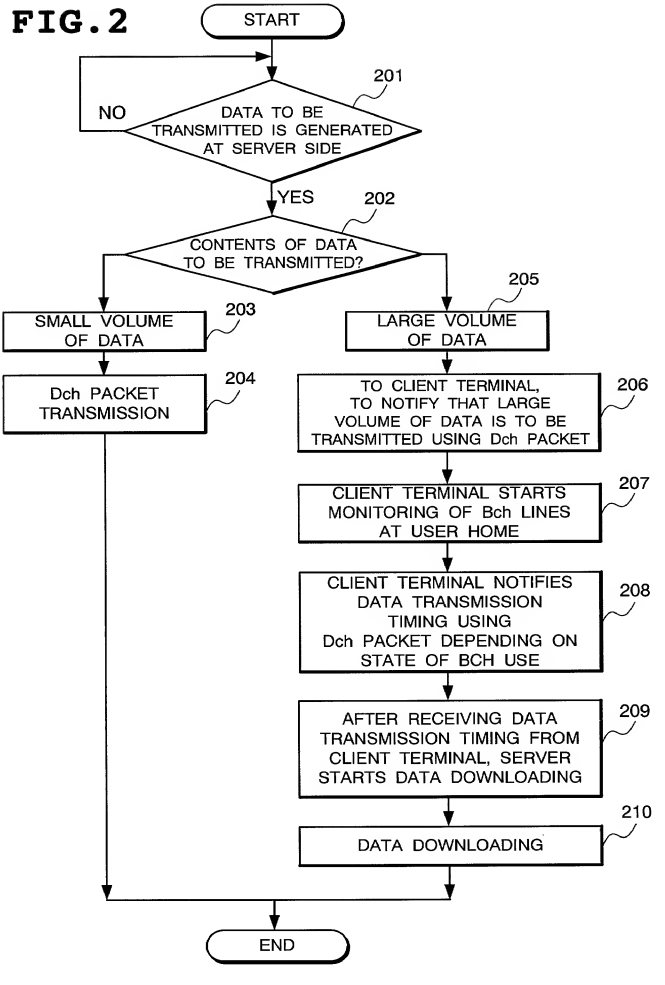

START
201
NO
DATA TO BE TRANSMITTED IS GENERATED AT SERVER SIDE
YES
202
CONTENTS OF DATA TO BE TRANSMITTED?
205
SMALL VOLUME OF DATA
203
LARGE VOLUME OF DATA
Dch PACKET TRANSMISSION
204
TO CLIENT TERMINAL, TO NOTIFY THAT LARGE VOLUME OF DATA IS TO BE TRANSMITTED USING Dch PACKET
206
CLIENT TERMINAL STARTS MONITORING OF Bch LINES AT USER HOME
207
CLIENT TERMINAL NOTIFIES DATA TRANSMISSION TIMING USING Dch PACKET DEPENDING ON STATE OF BCH USE
208
AFTER RECEIVING DATA TRANSMISSION TIMING FROM CLIENT TERMINAL, SERVER STARTS DATA DOWNLOADING
209
DATA DOWNLOADING
210
END

FIG.3

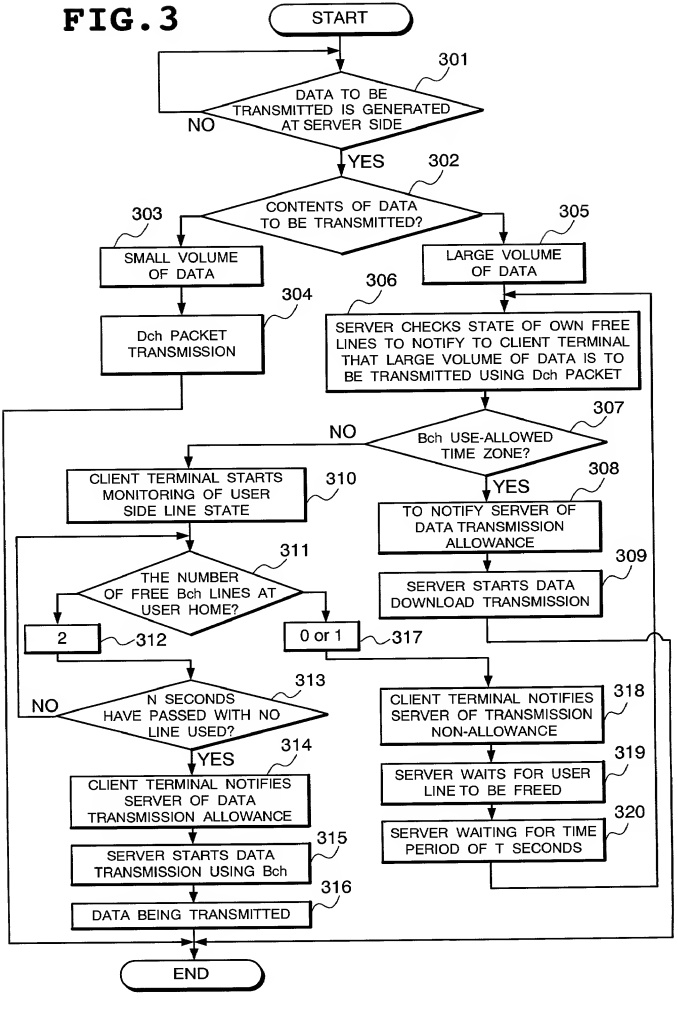
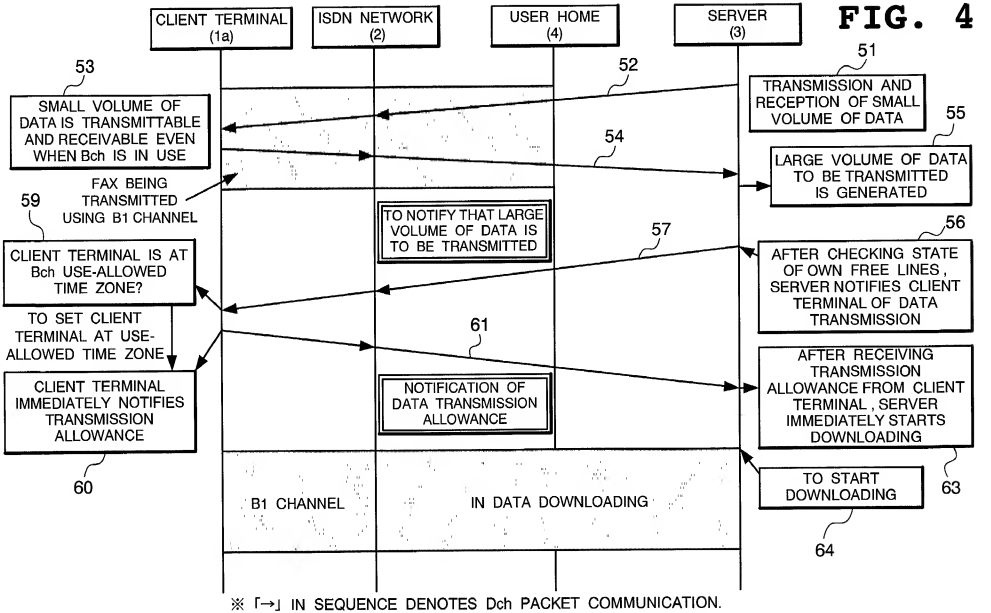
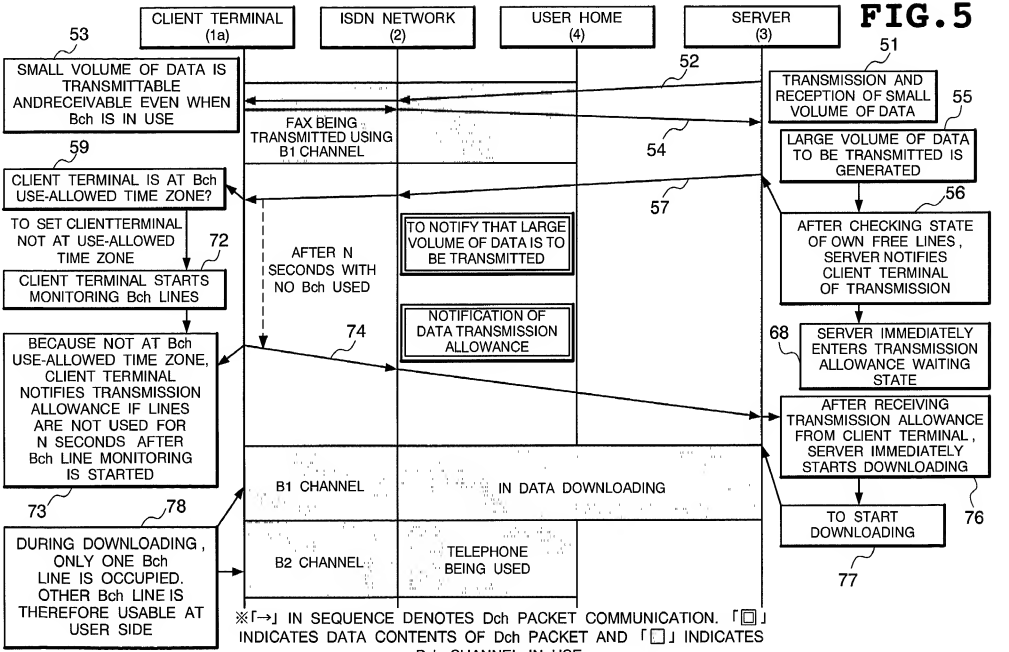

START
301
DATA TO BE TRANSMITTED IS GENERATED AT SERVER SIDE
NO
YES
302
CONTENTS OF DATA TO BE TRANSMITTED?
303
SMALL VOLUME OF DATA
305
LARGE VOLUME OF DATA
304
Dch PACKET TRANSMISSION
306
SERVER CHECKS STATE OF OWN FREE LINES TO NOTIFY TO CLIENT TERMINAL THAT LARGE VOLUME OF DATA IS TO BE TRANSMITTED USING Dch PACKET
307
Bch USE-ALLOWED TIME ZONE?
NO
YES
308
TO NOTIFY SERVER OF DATA TRANSMISSION ALLOWANCE
309
SERVER STARTS DATA DOWNLOAD TRANSMISSION
310
CLIENT TERMINAL STARTS MONITORING OF USER SIDE LINE STATE
311
THE NUMBER OF FREE Bch LINES AT USER HOME?
2
312
0 or 1
317
313
N SECONDS HAVE PASSED WITH NO LINE USED?
NO
YES
314
CLIENT TERMINAL NOTIFIES SERVER OF DATA TRANSMISSION ALLOWANCE
315
SERVER STARTS DATA TRANSMISSION USING Bch
316
DATA BEING TRANSMITTED
318
CLIENT TERMINAL NOTIFIES SERVER OF TRANSMISSION NON-ALLOWANCE
319
SERVER WAITS FOR USER LINE TO BE FREED
320
SERVER WAITING FOR TIME PERIOD OF T SECONDS
END

FIG. 4



※ 「→」 IN SEQUENCE DENOTES Dch PACKET COMMUNICATION.
「▣」 INDICATES DATA CONTENTS OF Dch PACKET AND
「□」 INDICATES Bch CHANNEL IN USE.

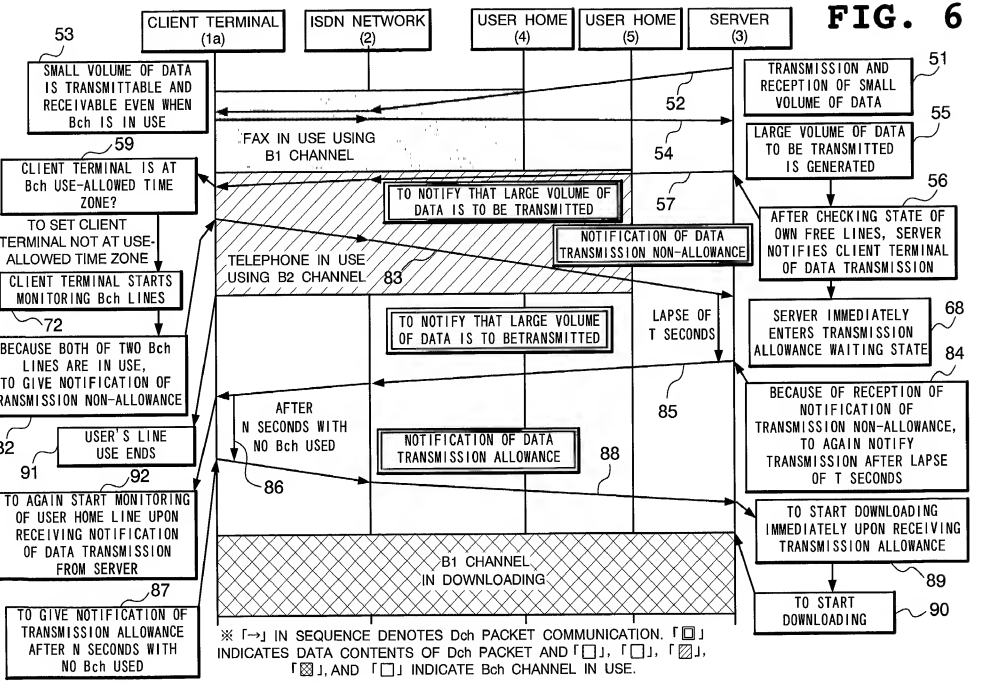
FIG.5



※「→」IN SEQUENCE DENOTES Dch PACKET COMMUNICATION. 「□」 INDICATES DATA CONTENTS OF Dch PACKET AND 「□」 INDICATES Bch CHANNEL IN USE.

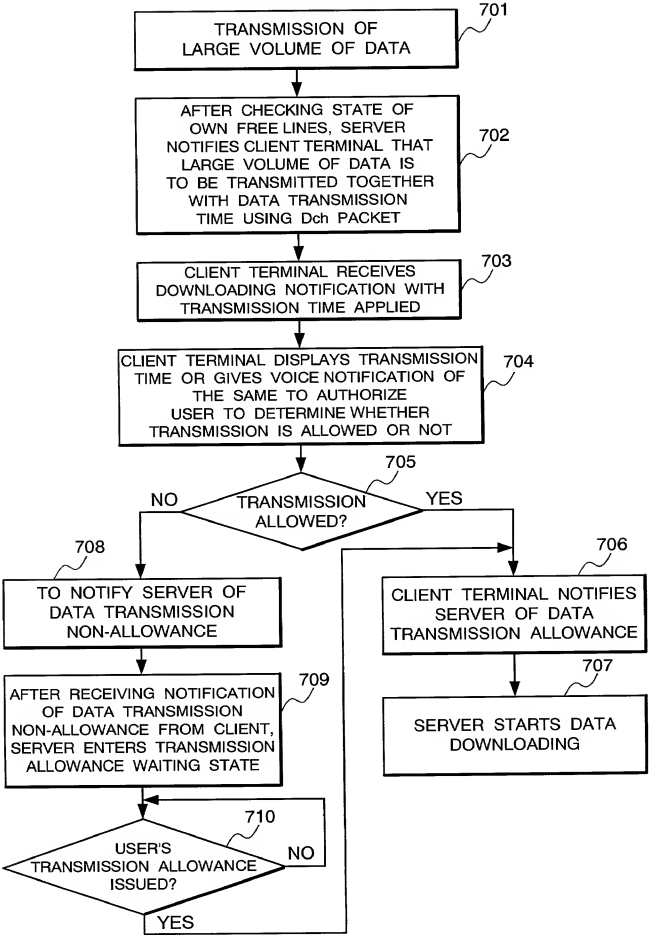
DERWENT-ACC-NO:

FIG. 6



※「→」IN SEQUENCE DENOTES Dch PACKET COMMUNICATION. 「▣」 INDICATES DATA CONTENTS OF Dch PACKET AND 「□」, 「□」, 「▨」, 「▩」, AND 「□」 INDICATE Bch CHANNEL IN USE.

FIG. 7


701
TRANSMISSION OF LARGE VOLUME OF DATA
702
AFTER CHECKING STATE OF OWN FREE LINES, SERVER NOTIFIES CLIENT TERMINAL THAT LARGE VOLUME OF DATA IS TO BE TRANSMITTED TOGETHER WITH DATA TRANSMISSION TIME USING Dch PACKET
703
CLIENT TERMINAL RECEIVES DOWNLOADING NOTIFICATION WITH TRANSMISSION TIME APPLIED
704
CLIENT TERMINAL DISPLAYS TRANSMISSION TIME OR GIVES VOICE NOTIFICATION OF THE SAME TO AUTHORIZE USER TO DETERMINE WHETHER TRANSMISSION IS ALLOWED OR NOT
705
TRANSMISSION ALLOWED?
NO
YES
706
CLIENT TERMINAL NOTIFIES SERVER OF DATA TRANSMISSION ALLOWANCE
707
SERVER STARTS DATA DOWNLOADING
708
TO NOTIFY SERVER OF DATA TRANSMISSION NON-ALLOWANCE
709
AFTER RECEIVING NOTIFICATION OF DATA TRANSMISSION NON-ALLOWANCE FROM CLIENT, SERVER ENTERS TRANSMISSION ALLOWANCE WAITING STATE
710
USER'S TRANSMISSION ALLOWANCE ISSUED?
NO
YES

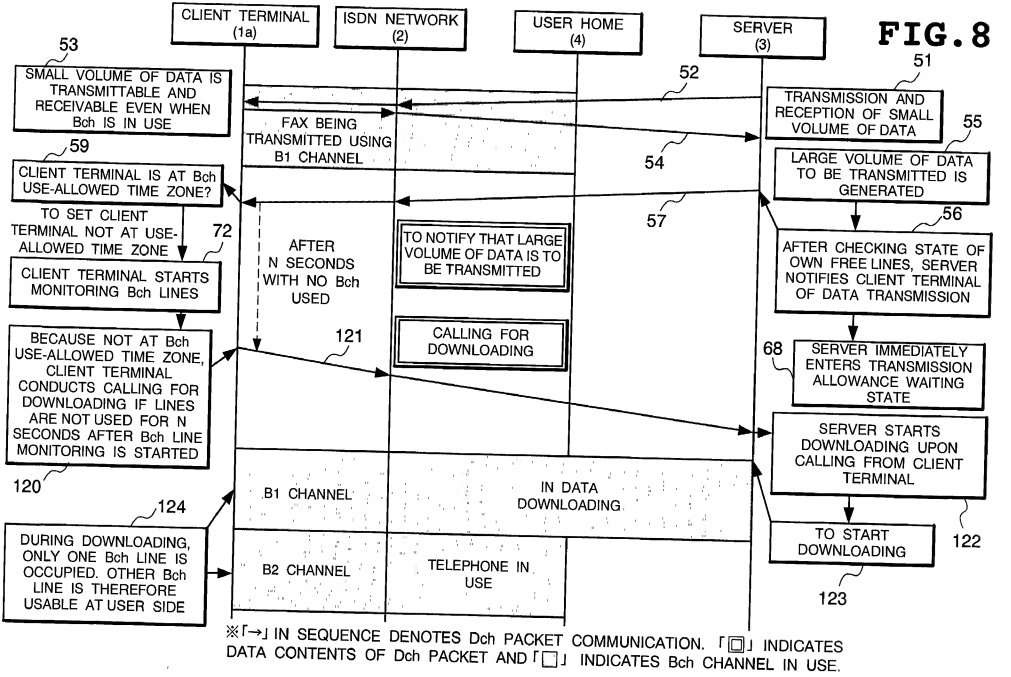
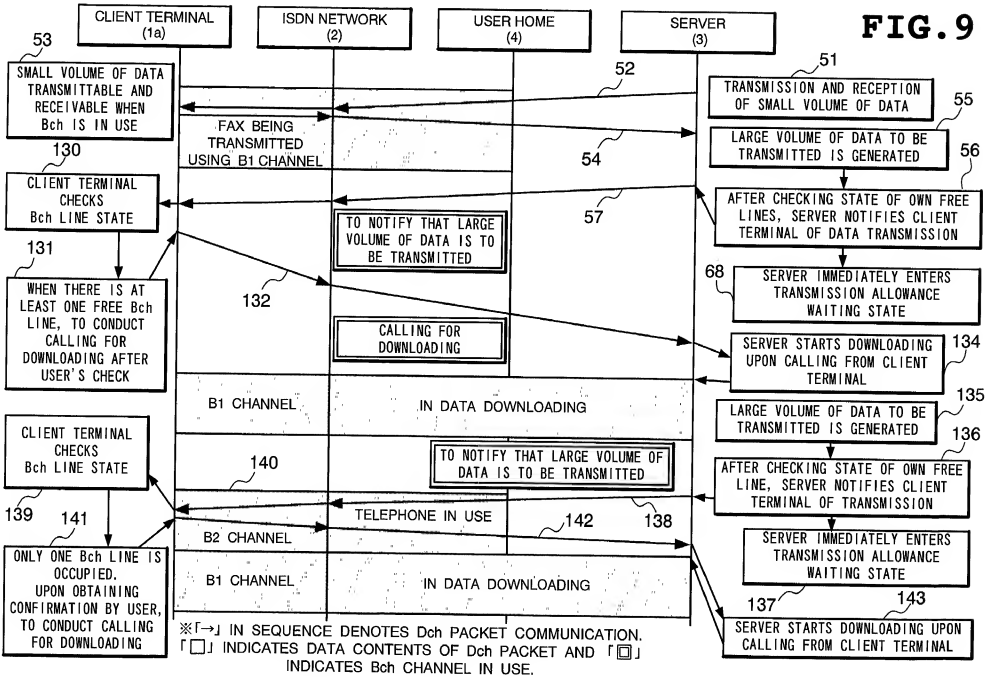


FIG. 8

※「→」IN SEQUENCE DENOTES Dch PACKET COMMUNICATION. 「▣」INDICATES DATA CONTENTS OF Dch PACKET AND 「□」INDICATES Bch CHANNEL IN USE.

FIG. 9



※「→」IN SEQUENCE DENOTES Dch PACKET COMMUNICATION.
「□」INDICATES DATA CONTENTS OF Dch PACKET AND 「▣」INDICATES Bch CHANNEL IN USE.

Declaration and Power of Attorney for Patent Application

特許出願宣言書

Japanese Language Declaration

私は、下欄に氏名を記載した発明として、以下の通り宣言する：

As a below named inventor, I hereby declare that:

私の住所、郵便の宛先および国籍は、下欄に氏名に続いて記載したとおりであり、

My residence, post office address and citizenship are as stated below next to my name,

名称の発明に関し、請求の範囲に記載した特許を求める主題の本来の、最初にして唯一の発明者である（一人の氏名のみが下欄に記載されている場合）か、もしくは本来の、最初にして共同の発明者である（複数の氏名が下欄に記載されている場合）と信じ、

I believe I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled

SERVER-CLIENT TYPE SYSTEM AND

DATA DOWNLOADING METHOD

その明細書を
（該当するほうに印を付す）

the specification of which
(check one)

☐ ここに添付する。

☒ is attached hereto.

☐ _____ 日に出願番号

第 _____ 号として提出し、

☐ was filed on _____ as

Application Serial No. _____

_____ 日に補正した。
（該当する場合）

and was amended on _____
(if applicable)

私は、前記のとおり補正した請求の範囲を含む前記明細書の内容を検討し、理解したことを陳述する。

I hereby state that I have reviewed and understand the contents of the above-identified specification, including the claims, as amended by any amendment referred to above.

私は、連邦規則法典第37部第1章第56条(a)項に従い、本願の審査に所要の情報を開示すべき義務を有することを認める。

I acknowledge the duty to disclose information which is material to the examination of this application in accordance with Title 37, Code of Federal Regulations, §1.56(a).

Japanese Language Declaration

私は、合衆国法典第35部第119条、第172条、又は第365条に基づく下記の外国特許出願又は発明者証出願の外国優先権利益を主張し、さらに優先権の主張に係わる基礎出願の出願日前の出願日を有する外国特許出願又は発明者証出願を以下に明記する：

I hereby claim foreign priority benefits under Title 35, United States Code §119, §172 or §365 of any foreign application(s) for patent or inventor's certificate listed below and have also identified below any foreign application for patent or inventor's certificate having a filing date before that of the application on which priority is claimed:

Prior foreign applications
先の外国出願

(Number) (番 号)	(Country) (国 名)	(Day/Month/Year Filed) (出願の年月日)	Priority claimed 優先権の主張 Yes あり	No なし
259979/1999	Japan	14/September/1999	☒	☐
			☐	☐
			☐	☐
			☐	☐
			☐	☐

私は、合衆国法典第35部第120条に基づく下記の合衆国特許出願の利益を主張し、本願の請求の範囲各項に記載の主題が合衆国法典第35部第112条第1項に規定の態様で先の合衆国出願に開示されていない限度において、先の出願の出願日と本願の国内出願日又はＰＣＴ国際出願日の間に公表された連邦規則法典第37部第1章第56条(a)項に記載の所要の情報を開示すべき義務を有することを認める。

I hereby claim the benefit of Title 35, United States Code, §120 of any United States application(s) listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States application in the manner provided by the first paragraph of Title 35, United States Code, §112, I acknowledge the duty to disclose any material information as defined in Title 37, Code of Federal Regulations, §1.56(a) which occurred between the filing date of the prior application and the national or PCT international filing date of this application:

(Application Serial No.) (出願番号)	(Filing Date) (出願日)	(現 況) 特許済み、係属中、放棄済み	(Status) (patended, pending abandoned)

私は、ここに自己の知識に基づいて行った陳述がすべて真実であり、自己の有する情報及び信ずるところに従って行った陳述が真実であると信じ、更に故意に虚偽の陳述等を行った場合、合衆国法典第18部第1001条により、罰金もしくは禁固に処せられるか、又はこれらの刑が併科され、又はかかる故意による虚偽の陳述が本願ないし本願に対して付与される特許の有効性を損なうことがあることを認識して、以上の陳述を行ったことを宣言する。

I hereby declare that all statements made herein of my own knowledge are true; and further that all statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issuing thereon.

Japanese Language Declaration

委任状： 私は、下記発明者として、以下の代理人をここに選任し、本願の手続きを遂行すること並びにこれに関する一切の行為を特許商標局に対して行うことを委任する。
（代理人氏名及び登録番号を明記のこと）

POWER OF ATTORNEY: As a named inventor, I hereby appoint the following attorney(s) and/or agent(s) to prosecute this application and transact all business in the Patent and Trademark Office connected therewith. ***(list name and registration number)***

I hereby appoint John H. Mion, Reg. No. 18,879; Donald E. Zinn, Reg. No. 19,046; Thomas J. Macpeak, Reg. No. 19,292; Robert J. Seas, Jr., Reg. No. 21,092; Darryl Mexic, Reg. No. 23,063; Robert V. Sloan, Reg. No. 22,775; Peter D. Olexy, Reg. No. 24,513; J. Frank Osha, Reg. No. 24,625; Waddell A. Biggart, Reg. No. 24,861; Robert G. McMorrow, Reg. No. 19,093; Louis Gubinsky, Reg. No. 24,835; Neil B. Siegel, Reg. No. 25,200; David J. Cushing, Reg. No. 28,703; John R. Inge, Reg. No. 26,916; Joseph J. Ruch, Jr., Reg. No. 26,577; Sheldon I. Landsman, Reg. No. 25,430; Richard C. Turner, Reg. No. 29,710; Howard L. Bernstein, Reg. No. 25,665; Alan J. Kasper, Reg. No. 25,426; Kenneth J. Burchfiel, Reg. No. 31,333; Gordon Kit, Reg. No. 30,764; Susan J. Mack, Reg. No. 30,951; Frank L. Bernstein, Reg. No. 31,484; Mark Boland, Reg. No. 32,197; William H. Mandir, Reg. No. 32,156; Scott M. Daniels, Reg. No. 32,562; Brian W. Hannon, Reg. No. 32,778; Abraham J. Rosner, Reg. No. 33,276; Bruce E. Kramer, Reg. No. 33,725; Paul F. Neils, Reg. No. 33,102; and Brett S. Sylvester, Reg. No. 32,765, my attorneys to prosecute this application and to transact all business in the Patent and Trademark Office connected therewith, and request that all correspondence about the application be addressed to SUGHRUE, MION, ZINN, MACPEAK & SEAS, PLLC, 2100 Pennsylvania Avenue, N.W., Washington, D.C. 20037-3202.

書類の送付先： Send Correspondence to:

SUGHRUE, MION, ZINN, MACPEAK & SEAS
2100 Pennsylvania Avenue, N.W., Washington, D.C. 20037

直通電話連絡先： （名称及び電話番号） Direct Telephone Calls to: ***(name and telephone number)***

(202)293-7060

唯一の又は第一の発明者の氏名	Full name of sole or first inventor Masaaki SATOU
同発明者の署名 日付	Inventor's signature 佐藤 Date Masaaki Satou Aug. 25, 2000
住所	Residence Tokyo, Japan
国籍	Citizenship Japan
郵便の宛先	Post office address c/o NEC Corporation, 7-1, Shiba 5-chome, Minato-ku, Tokyo, Japan
第二の共同発明者の氏名（該当する場合）	Full name of second joint inventor, if any
同第二発明者の署名 日付	Second inventor's signature Date
住所	Residence
国籍	Citizenship
郵便の宛先	Post office address

（第三又はそれ以降の共同発明者に対しても同様な情報および署名を提供すること。）

(Supply similar information and signature for third and subsequent joint inventors.)